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ABSTRACT

This digest addresses cognitive learning with respect to outside-the-classroom instruction at the elementary school level. It notes that affective, not cognitive, learning has traditionally been the primary objective of field instruction at all K-12 levels. Therefore, most educational research in field instruction has been mainly non-cognitive in nature. This document provides a summary of selected research that has had a connection with the cognitive gains possible in outside-the-classroom instruction, citing studies done in school situations, as well as in museums, zoos, and other novel settings. None of the studies reported in this document have made claims that out-of-classroom learning experiences are sufficient in themselves to produce significant cognitive gains with elementary students. However, there is evidence to suggest that in-the-environment instruction is useful in promoting and achieving cognition gains when effectively planned and managed. Several suggestions for further research into this area are made. (TW)

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ERIC/SMEAC Environmental Education Digest — No. 2, 1987

COGNITIVE LEARNING IN THE ENVIRONMENT: ELEMENTARY STUDENTS

Cognitive learning in the environment as it relates to secondary schools and students was the topic of a recent ERIC/SMEAC *Environmental Education Digest* (Lisowski and Disinger, 1987). The situation with respect to outside-the-classroom instruction is somewhat different in the elementary setting, and is the topic of this digest.

There are a number of similarities between the field instruction situations in elementary and secondary schools, the most prominent being that affective, not cognitive, learning has traditionally been the primary objective of field instruction at all K-12 levels. Likewise, most of the educational research dealing with learning in the environment—or, more generally, outside the classroom—at both elementary and secondary levels has centered on non-cognitive areas (Disinger, 1984).

The organizational patterns of elementary schools are typically such that there are fewer difficulties in arranging for out-of-school activities, in comparison to secondary schools. Primarily, the self-contained elementary school classroom allows for flexible scheduling—that is, the absence of rigid time frames for instruction in specific subject areas makes it more feasible for the elementary teacher to arrange to leave the classroom and engage in "outside" ventures. Also, because the elementary teacher is of necessity more of a generalist than his/her secondary school counterpart, there is greater potential for the planned integration of knowledge which is possible through in-the-environment experiences.

Countering these factors, the elementary teacher is typically not well-versed in the various specific content areas associated with field learning, and generally sees his/her primary task as instruction in the historically identified "basic skills" areas, otherwise known as the 3 Rs. Much of this is the result of the teacher education/training required of and available to the elementary teacher; it generally does not provide depth in the sciences or social studies.

Elementary teachers are, however, generally quick to identify and take advantage of learning situations which motivate students; outside-the-classroom activity clearly provides such opportunities. But their intent and anticipated outcomes of such ventures are frequently in the affective domain, with expectation of and planning for cognitive gain being at best of secondary importance.

"...Should There Be Taught"

L. B. Sharp's dictum, "Those things which can best be taught outdoors should there be taught" (quoted by Donaldson and Donaldson, 1958) has been accepted as a truism by many outdoor educators, and by extrapolation for all who promote outside-the-classroom learning, for many years. Sharp, his associates, and their followers have provided numerous examples of situations where in-the-environment learning was, or could be, more effective than about-the-environment learning in the classroom. It is critical to point out that they did *not* suggest that all learning about the environment was best achieved outside the classroom; they promoted the idea that educators should take advantage of those situations where in-the-environment learning offers distinct educational advantages, including cognitive ones, to other modes of instruction. Few of their pronouncements were supported by rigorous research; it is not that their work did not and has not produced significant results, but that most of their reports were anecdotal. For example, they conducted and reported few well-controlled empirical research studies, particularly with respect to cognitive learning.

An early study which attempted to address the merits of learning in the environment was reported by the New York City Board of Education (1947). Two experimental groups consisting of 62 fifth and sixth graders, and two control groups were used to investigate the effects of the Life Camps program, a residential camping experience, on academic growth in five areas: interest, arithmetic, science and health education, vocabulary, and nature study. The first report of results indicated "initial and final superiority of the experimental group"; this report has long been cited as conclusive evidence of the value of outdoor education in facilitating cognitive development.

However, Backman and Crompton (1984-85) have re-analyzed the results, suggesting that the research design was not rigorous and that the conclusions are overly optimistic, and certainly not definitive.

An attempt to replicate the Life Camps study was made by Huntley (1979). Using 94 sixth grade boys and girls as subjects, he established control and experimental groups, the former being taught in an established classroom and the latter participating in outdoor education experiences. The groups were similar at the beginning of the study; both were taught by regular school district faculty. All participants completed pre- and post-tests over four curriculum areas: nature study, mathematics, science, and vocabulary. At the conclusion of this study, no statistically significant differences were found between the groups in any of the four curriculum areas.

Based on the results of his study involving fifth-grade students, Howle (1974) determined that students need extensive and structured programs of advance organization in order to gain maximum benefit from field experiences. He concluded that environmental education field programs should be built as extensions of the classroom, not as unique, isolated events; "the most exciting outdoor program is only as beneficial to the students as the preparation their classroom teachers were competent enough to prepare." His prescription for "the most effective program" identified four phases—teacher in-service training, classroom development of advance organization, the field experience, and follow-up in the classroom, with further application and conceptualization.

Comparative Studies

In an attempt to compare effectiveness in the promotion of cognitive learning in environmental education of field instruction and audio-visual instruction using a three-screen slide-tape presentation, Hosley (1974) developed an instructional unit based on the "balance of nature" concept, using a table of specifications following the Bloom, et al., *Taxonomy of Educational Objectives: Cognitive Domain* (1956) to organize anticipated cognitive learnings. Two versions of the instructional unit were prepared. One-hundred fifth-grade students were selected at random, and equally divided into four treatment groups—no instruction, slide presentation only, field approach only, and both slide presentation and field approach. A post (retention) study indicated that the slide presentation and field approaches produced similar retention, but that students receiving both treatments scored highest.

Gross and Pizzini (1979) analyzed the effects of a treatment consisting of advance organizers and a one-day field experience on environmental orientations of upper elementary students. Environmental orientations are described as expressed responses of individuals to both general and specific areas of their environments, and reflect both affective and cognitive inputs; their interactions are involved in making environmental decisions in an integrated manner. The results of this study indicated an observable change in the environmental orientations of fifth-and-sixth-grade students, which the authors attributed to the combination of advance organizers and field experience.

Werling (1979) developed a model whereby parks-based (nonformal) environmental educators could act as organizing forces to move from the initial stage of school, youth, and adult group visits to an environmental education center to a second phase in which they put their learnings into practice by improving the stewardship of school site and neighborhood outdoor laboratories. Working

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with fourth- and fifth-grade students, he compared learning of Science Curriculum Improvement Studies (SCIS) content taught indoors, both with and without environmental lectures, to a modified SCIS approach in association with site stewardship. He found that pupils learned SCIS life science concepts as well outdoors as indoors, and that the outdoor (site-stewardship) groups gained significantly more environmental knowledge than either of the indoor groups.

Museums and Zoos

Stronck (1983) investigated attitudes and learning of school children from grades 5-7 (N = 816) in 31 museum tours. He concluded that students made greater cognitive gains, but demonstrated less positive attitudes, when participating in structured tours led by museum personnel. Conversely, less cognitive gain but more positive attitudes were found when students participated in less-structured tours led by their classroom teachers.

Cognitive and affective outcomes of a class visit to a participatory science museum were examined by Flexer and Borun (1984) by comparing responses of 416 fifth and sixth graders randomly assigned to four conditions (control, exhibit only, lesson only, and exhibit followed by lesson) and two tests (verbal and visual). Students visiting a simple machine exhibit scored higher on a test of science content than did the control group, but lower than the group attending a classroom lesson in the museum. The study did not demonstrate conclusively a cognitive advantage of having the exhibit experience prior to the lesson. Scores on the visual test were consistently higher than scores on the verbal test. Study findings indicated that the particular strength of the science museum exhibit lies in the affective domain; students found the exhibit much more enjoyable, interesting, and motivational than a classroom lesson. Thus, they concluded that a science museum, by providing exhibits which generate enthusiasm for and interest in learning science, can serve as a valuable adjunct to formal, in-school instruction.

A single-visit, structured tour of a specific area of a zoological park can be a significant learning experience for elementary students (Falk and Balling, 1982b). This study, one of a series conducted by personnel of the Smithsonian Institution's Chesapeake Bay Center for Environmental Studies, demonstrated that children do learn a great deal on well-structured field trips, indicating that design and execution of the field experience, including well planned pre-trip orientation, are critical. Also, the most effective pre-trip orientation was that conducted by the classroom teacher, trained in advance by a targeted workshop. Orientation by a resource person from the zoo, or by the classroom teacher supported only by zoo-generated printed materials, was found to be less useful.

Novel Settings

Most children in the 10-12 year-old age range are ready for and can thrive on day-long trips to novel settings such as museums, outdoor centers, and zoos (Falk, 1983). For children between 7 and 13 years of age, novel environments are poor settings for imposed task learning, when compared to familiar environments (Martin, et al., 1981). Thus, younger children are likely to learn more from field experience in a more familiar setting, such as one near their school (Falk and Balling, 1982a). These children may need more than one trip to the same site to overcome the negative effects of novelty; the younger the children, the more likely the novelty of an unfamiliar setting is to interfere with cognitive learning, so the need for familiarization is greater.

Classificatory behavior of 41 fourth-grade students enrolled in a science program at the National Zoological Park in Washington, DC, was assessed on an instrument adapted from Piaget's interviews with children on class inclusion—their understanding of the inclusiveness of classes of animals within a hierarchical structure (Lockett, 1982). One goal selected from the evaluation of program effectiveness was to determine how well students had learned the zoological classification system and the characteristics of animals within the vertebrate class. Data analysis showed that students with a high understanding of class inclusion performed better in the program at the zoo. The data also supported Piaget's finding that a lag exists in children's application of class inclusion to animal classes. The results imply that educators should keep in mind the developmental levels of students when planning programs, specifically (in this instance) out-of-classroom visits to zoos—and provide students with opportunities to extend emerging cognitive abilities to new situations, such as those encountered in field settings.

Summary

None of the recent studies reported here have made claims that out-of-classroom learning experiences are sufficient in themselves to produce significant cognitive gains with elementary students. Factors such as lack of readiness, or too much novelty, can mitigate against successful cognitive instruction in such situations.

However, there is ample evidence that in-the-environment instruction is useful in promoting and achieving cognitive gain when effectively planned and managed. Advance organizers for students and coordination with other modes of instruction appear to be effective in promoting cognitive gain through use of field activities, as do care in the selection of learning environments, recognition and mitigation of the effects of novelty, and attention to readiness factors. There appears to be little doubt that elementary students can profit cognitively from outside-the-classroom experiences, but much more must be learned about how to structure them, and to integrate them with other modes of instruction, to take full advantage of these possibilities. In addition, longitudinal studies are needed to determine the long term impact of these modes of instruction.

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